1. A method to control etch profile while etching a microelectronics substrate that involves side wall deposition, comprising:

pulsing at least one etching gas, wherein said pulsing imparts a time varying flow rate to said gas for a plurality of periods of said time varying flow rate; and

etching a substrate with said at least one gas during said pulsing.

2. The method as defined in Claim 1, wherein said pulsing is applied at a duty cycle range selected from the group consisting of:

from about 20% to about 80% duty cycle;

from about 30% to about 70% duty cycle; and

from about 40% to about 60% duty cycle.

3. The method as defined in Claim 1, wherein said at least one gas comprises at least one gas selected from the group consisting of CHF_3, CH_2F_2, a halogenated hydrocarbon, a hydrofluorocarbon, CO, CO_2, O_2, Ar, a fluorocarbon, CF_4, C_4F_8, C_5F_8, BCl_3, Cl_2.

4. The method as defined in Claim 1, wherein said pulsing is controlled with at least one piezoelectric valve.

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5. A method to control etch profile while etching a microelectronics substrate, the method comprising:

providing an etch chamber and a microelectronics substrate disposed therein;

pulsing into said etch chamber at least one gas suitable for forming a deposit on at least a portion of said microelectronics substrate, wherein said pulsing imparts a time varying flow rate to said gas for a plurality of periods of said time varying flow rate; and

etching said microelelectronics substrate with said at least one gas.

6. The method as defined in Claim 5, wherein said etch chamber is associated with a high density etch tool.

7. The method as defined in Claim 5, wherein said substrate is selected from the group consisting of an oxide film, a resist, a multi-layer resist, a metal, a metal alloy, an aluminum alloy, a refractory metal, tungsten, an electrical conductor, polysilicon, and at least one polysilicide.

8. The method as defined in Claim 5, wherein said pulsing is applied so that said at least one gas reaches steady state concentration within said etch chamber in at least one of said plurality of periods.

9. The method as defined in Claim 5, wherein said pulsing is applied so that said at least one gas does not reach steady state concentration within said etch chamber in said plurality of periods.

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Sub C5

10. The method as defined in Claim 5, wherein said pulsing is applied at a duty cycle range selected from the group consisting of:

from about 20% to about 80% duty cycle;

from about 30% to about 70% duty cycle; and

from about 40% to about 60% duty cycle.

11. The method as defined in Claim 5, wherein said at least one gas comprises a gas selected from the group consisting of CHF_3, CH_2F_2, a halogenated hydrocarbon, a hydrofluorocarbon, CO, CO_2, O_2, Ar, a fluorocarbon, CF_4, C_4F_8, C_5F_8, BCl_3, Cl_2.

12. The method as defined in Claim 5, further comprising flowing a second gas comprising at least one of the gases nitrogen, oxygen and an inert gas into said etch chamber.

13. The method as defined in Claim 5, wherein said time varying flow rate varying within a range selected from the group consisting of:

between a high flow rate value of about 30 sccm to a low flow rate value of about 15 sccm;

between a high flow rate value of about 27 sccm to a low flow rate value of about 18 sccm;

between a high flow rate value of about 25 sccm to a low flow rate value of about 20 sccm;

between a low flow rate value of about 20 sccm to a high flow rate value of about 30 sccm; and

between a low flow rate value of about 15 sccm to a high flow rate value of about 20 sccm.

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14. The method as defined in Claim 13, wherein each of the high and low flow rate values has about the same time duration.

15. The method as defined in Claim 5, wherein said pulsing is controlled with at least one piezoelectric valve.

16. The method as defined in Claim 5, wherein said etching is a process selected from the group consisting of:

an anisotropic self-aligned contact etch; and

an anisotropic high aspect ratio contact etch, wherein the aspect ratio is at least 4 to 1.

17. The method as defined in Claim 5, further comprising, prior to providing said etch chamber, patterning a layered substrate with a photoresist mask to form said microelectronics substrate.

18. The method as defined in Claim 17, wherein said layered substrate comprises an oxide layer and a nitride layer disposed on a silicon layer.

19. The method as defined in Claim 18, wherein said etching halts on said silicon layer.

20. The method as defined in Claim 5, further comprising flowing an etchant gas into said etch chamber.

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21. The method as defined in Claim 20, wherein said etchant gas is selected from the group consisting of a polymer forming gas, an etching gas, and a fluorocarbon.

22. The method as defined in Claim 17, wherein said layered substrate comprises at least an oxide layer; the method further comprising flowing an etchant gas into said etch chamber, wherein said etchant gas selectively removes at least a portion of said oxide layer.

Sub B3

23. The method as defined in Claim 5, wherein:

said etching gas is a protective layer forming gas;

said microelectronics substrate has at least an oxide layer; and

said polymer forming gas selectively removes at least a portion of said oxide layer and a vertical profile in said oxide layer.

Sub C7

24. The method as defined in Claim 23, wherein said oxide layer comprises BPSG.

Sub A4

25. The method as defined in Claim 5, wherein said microelectronics structure includes a nitride layer.

Sub C9

26. The method as defined in Claim 25, wherein said nitride layer is at least one of a silicon nitride layer and a silicon oxynitride layer.

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27. A method of etching oxide using a polymer, the method comprising:

disposing a patterned semiconductor substrate in a high density plasma etcher, said substrate comprising a silicon layer with a gate stack structure disposed thereon, said gate stack structure being encapsulated by silicon nitride, and layered with an oxide;

selectively removing portions of said oxide by pulsing a fluorocarbon gas, wherein:

said pulsing imparts a time varying flow rate to said fluorocarbon gas for a plurality of periods of said time varying flow rate; and

said fluorocarbon gas forms a protective layer;

removing said polymer.

28. The method as defined in Claim 27, wherein said protective layer is removed with a hydrofluorocarbon gas.

29. The method as defined in Claim 28, wherein said hydrofluorocarbon gas is pulsed into said high density etcher, wherein pulsing said hydrofluorocarbon gas imparts a time varying flow rate to said hydrofluorocarbon gas for a plurality of periods of said time varying flow rate.

30. The method as defined in Claim 29, wherein said hydrofluorocarbon gas is pulsed into said high density etcher with at least one piezoelectric valve.

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Sub A6

31. A etching method comprising:

forming a photoresist pattern on a microelectronics substrate that includes both an oxide layer and a nitride layer disposed on a silicon layer;

providing an etch chamber and said microelectronics substrate disposed therein;

pulsing into said etch chamber at least one gas suitable for forming a deposit on at least a portion of said microelectronics substrate, wherein:

said deposit is selected from the group consisting of an oxide film, a resist, a multi-layer resist, a metal, a metal alloy, an aluminum alloy, a refractory metal, tungsten, an electrical conductor, polysilicon, and at least one polysilicide;

said at least one gas comprises a gas selected from the group consisting of CHF_3, CH_2F_2, a halogenated hydrocarbon, a hydrofluorocarbon, CO, CO_2, O_2, Ar, a fluorocarbon, CF_4, C_4F_8, C_5F_8, BCl_3, Cl_2;

said pulsing imparts a time varying flow rate to said gas for a plurality of periods of said time varying flow rate;

said pulsing is applied at a duty cycle range selected from the group consisting of:

from about 20% to about 80% duty cycle;

from about 30% to about 70% duty cycle; and

from about 40% to about 60% duty cycle;

said time varying flow rate varies within a range selected from the group consisting of:

between a high flow rate value of about 30 sccm to a low flow rate value of about 15 sccm;

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between a high flow rate value of about 27 sccm to a low flow rate value of about 18 sccm;

between a high flow rate value of about 25 sccm to a low flow rate value of about 20 sccm;

between a high flow rate value of about 20 sccm to a low flow rate value of about 30 sccm; and

between a high flow rate value of about 15 sccm to a low flow rate value of about 20 sccm;

etching said microelectronics substrate with said at least one gas during said pulsing, wherein:

said etching halts on said silicon layer;

said etchant gas is selected from the group consisting of a polymer forming gas, a polymer etching gas, and a fluorocarbon;

said etchant gas selectively removes at least a portion of said oxide layer.

32. The method as defined in Claim 31, wherein said pulsing is applied so that said at least one gas reaches steady state concentration within said etch chamber in at least one of said plurality of periods.

33. The method as defined in Claim 31, wherein said pulsing is applied so that said at least one gas does not reach steady state concentration within said etch chamber in said plurality of periods.

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Sub A1

34. The method as defined in Claim 31, further comprising flowing a second gas comprising at least one of the gases nitrogen, oxygen and an inert gas into said etch chamber.

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35. An etching method comprising:

exposing a substrate to a plurality of gases, wherein at least one of said gases is pulsed and said pulsing imparts a time varying flow rate to said at least one gas for a plurality of periods of said time varying flow rate; and wherein

at least one of said gases comprises an etchant gas; and

at least one of said gases comprises a gas for depositing a protective layer.

Sub C16

36. The method as defined in Claim 35, wherein

at least one of said gases comprises a gas that modifies the deposition of said protective layer; and

at least one of said gases comprises an etch modifying gas.

Sub C17

36. The method as defined in Claim 35, wherein said etchant gas comprises one gas selected from the group consisting of a hydrofluorocarbon and a fluorocarbon.

Sub A8

37. The method as defined in Claim 35, wherein said gas for depositing a protective layer comprises one gas for depositing a polymer.

38. The method as defined in Claim 36, wherein said gas that modifies the deposition of a protective layer is selected from the group consisting of CO, CO_2, and O_2.

39. The method as defined in Claim 36, wherein said etch modifying gas is selected from the group consisting of BCl_3 and Cl_2.

add A9

add C21

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